

PHILADELPHIA WATER DEPARTMENT



ANNUAL REPORT
FISCAL 1982

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ABOVE: To check a sewer, Tommy Cross, Sewer Maintenance Inspector, wears a Scott Air-Pak and a safety harness held by another Inspector, John Spence.

FRONT COVER: By listening to the sound intensity, Gerald Stokes, Water Distribution Foreman, (right) and Ronald Mungro, Repairman, can pinpoint the location of this water main break.

Philadelphia Water Department

How Do We Reach Our Goal?

We Need a Plan.....

"Would you tell me please, which way I ought to go from here?"

"That depends a good deal on where you want to get to," said the Cat.

"I don't much care where—" said Alice.

"Then it doesn't matter which way you go," said the Cat.

*Alice in Wonderland
by Lewis Carroll*

In any well run organization, management must establish goals and then develop plans to reach them.

The development of a Financial Management Plan in 1981 was an important milestone in the history of the Water Department. A few long range planning reports had been developed over the last 25 years but they were vague and had never been implemented.

Because this 57 page Financial Management Report is important to all our customers, as well as our bondholders, we are presenting a condensed version in the first section of this Annual Report. Specific statistics on the Department's accomplishments during Fiscal 1982 may be found under the Water, Water Pollution Control, Engineering and Fiscal Sections.

William J. Green
Mayor

Rodney D. Johnson
Managing Director

William J. Marrazzo
Water Commissioner

Need For a Financial Management Plan

Although a number of positive steps were taken in Fiscal 1981 to improve the operation of the Water Department, it became increasingly clear that a long range financial management plan was necessary to guide the Department in making decisions which would take it successfully through the next decade. The plan, completed in September of 1981, is of vital importance, not simply because it is a necessary component of sound utility management, but because today we are planning and operating under conditions which are radically different from those we faced over the past twenty-five years. The Water Department must adjust to the changes which are already evident and those we can anticipate in order to continue our successful operation into the 1990's.

The principal areas of concern facing the Water Department are:

- **Fewer Customers**

One of the most dramatic and meaningful changes has been confirmed by the results of the 1980 census: rapid population growth in Philadelphia has been replaced by a slow decline in the number of people living here. We expect the population to stabilize eventually, but it will probably be at a level lower than that of 1980, and certainly lower than the levels we projected when plans for future service needs were developed in the 1960's.

- **Rising Unit Prices of Service**

Concern over affordability is a second major change. The extended period of high inflation, coupled with real increases in energy costs, have affected all our customers. Compliance with recent environmental regulations has entailed substantial cost increases. Future decisions must be made with due consideration for the fact that the rates we charge must be tolerable to those we expect to pay them.

- **Financing Larger Capital Budgets**

A third area in which conditions have changed alarmingly is the availability of financial resources. The municipal bond market has been unfavorable for some time, and there is a limit to the borrowing the market will accept. Proposition 13 in California and similar taxing and spending limits imposed on governments around the nation are symptomatic of the public's unwillingness to support continued high levels of government spending. We are operating in a period of limited resources and we must manage this utility accordingly.

In spite of the gravity of the situation, Philadelphia is in an enviable position; we have the means to respond to these changes as challenges rather than submit to them as insurmountable obstacles. For example, we are upgrading and expanding our wastewater treatment facilities, and enjoying the benefit of 75% federal funding as we do so. With the uncertainty surrounding the continuation of EPA's construction grants program, there are other cities which may not be so fortunate in obtaining grants. Philadelphia will have modern, efficient water pollution control plants with capacity to last well beyond their original 1990 planning horizons. As another example, Philadelphia enjoys sources of water supply which, while subject to the effects of drought, are not nearly so limited as are those of many other cities. Our water treatment facilities, although not new, are basically sound. They are able to provide water which meets all current drinking standards, and they too have capacities to carry the City into the next century. In other words, we have the basis to continue to provide in an economically realistic way the services our customers and our environment require; it is up to us to pursue a reasonable and responsible financial management strategy to accomplish it.

Capital Budgeting

The City of Philadelphia's capital expenditures are guided by a capital program which includes the current fiscal year and the five subsequent years. The program is compiled annually by the City Planning Commission on the basis of information obtained from the operating departments by the Director of Finance. After review and approval by the Mayor, the program is submitted to City Council and, upon completion of hearings, it is enacted as an ordinance of the City.

Management's objectives in future Capital Budgeting are:

1. Maintain the water and wastewater systems to provide environmentally safe and reliable service to customers at minimum cost.
2. Avoid expenditures for facilities in excess of those required to meet Philadelphia's projected needs, except where required by law or where economically justified by operating cost decreases or by revenue increases expected to result.
3. Properly allocate expenditures which should be shared or funded in their entirety by revenue from tax related measures.
4. Reduce long-term dependence of the Water Department on debt financing.

Listed below are several specific actions which have already been taken to move the Department toward attainment of these objectives.

Capital Budget Review

The 1982-1987 Capital Program was re-examined in detail to identify projects which were not consistent with the objectives set out above. In this revised Program, a total of \$164 million was presented to City Council for elimination. This represents a 22% reduction for the five year period. These cuts were determined by (1) eliminating items with low cost-benefit ratios; (2) reducing the magnitude or size of projects to a level more appropriate with the population level of the service area; and (3) shifting out of the Water Department's budget projects in the area of storm flood relief which may be important to the City, but are not appropriate expenditures of revenues from water and sewer rates.

The same review is continuing with respect to the Water Pollution Abatement Program, where changing federal and state funding and regulating priorities and downward revision of projected needs suggest the possibility of reducing the size of planned facilities not already under construction. Negotiations with U.S. EPA and PA DER have been initiated on this subject, and the Department's engineering consultants are evaluating alternatives.

Beyond 1987

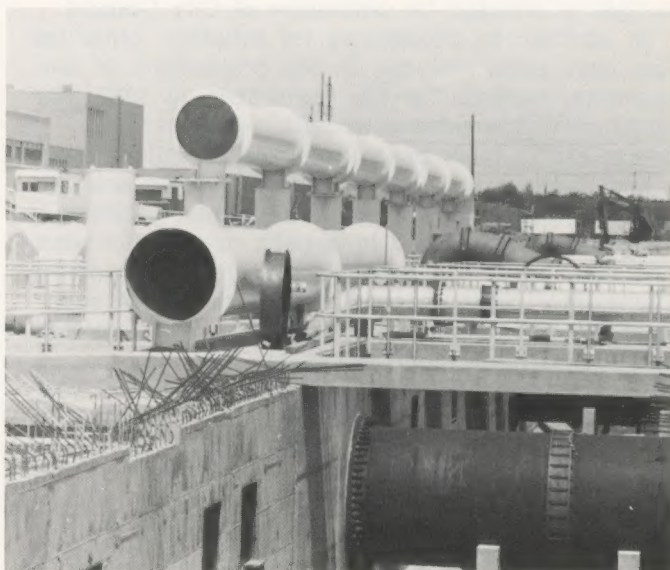
The Water Department has forecast its needs for capital expenditures beyond 1987. These needs are essentially for renewal and replacement of components of the existing systems; no major new facilities are expected to be needed in the foreseeable future. The 1988-1992 projects of capital expenditures have been based on projected achievement of the first objective listed above and will serve as guidelines for the capital budgeting process. Emphasis is being placed on implementing the accelerated rehabilitation of the water distribution system, sewer system rehabilitation at current levels of expenditure, and routine renovation and replacement of various system components. The Water Pollution Abatement Program will have been completed by 1986.

Capitalized Interest

In previous revenue bond sales, the Water Department has capitalized interest for two years and deferred payment of principal for the same period. Because the rate increase which became effective July 1, 1981 was predicated on continuation of that practice, it applied to the Seventh Series Revenue Bonds sold in October, 1981. For all subsequent bond issues, interest will be capitalized and principal payments deferred for only one year. This will reduce the required size of those issues somewhat.



Expansion and upgrading continued at the \$371 million Northeast Pollution Control Plant (below) and at the \$182 million Southeast Plant (above).



Renewal and Replacement Fund

The supplemental ordinance authorizing the issuance of the Seventh Series Revenue Bonds also establishes a Renewal and Replacement Fund. Deposits to the fund are to be made from interest earned on the Sinking Fund Reserve and the Capital Improvement Fund. The fund, which may build to a maximum of 25 percent of maximum future annual debt service, is to be used, as its name suggests, to pay for renewal and replacement of system components which are capital facilities—i.e., have a life of five years or more. The first deposit will be made in Fiscal Year 1984, since the current water and sewer rates were established before it came into existence.

The overall effect of the Renewal and Replacement Fund will be to shift the financing of many programs from debt service to operating revenues in an effort to incorporate a pay-as-you-go approach in the financial management of the Water Department.

Operating Budget

The operating budget for the Water Department consists of all costs necessary for the operation, maintenance and administration of the water and sewer systems. Preparation of the operating budget begins in the fall of the year prior to each fiscal year. Estimates of the next fiscal year's expenses are derived from an analysis of past expenses and from projected implementation of new programs designed to meet Department goals and objectives. The initial budget as refined by management is presented to City Council in the spring prior to the fiscal year. After a period of hearings, the operating budget is enacted by ordinance of City Council.

In addition to allowances for inflation, other factors have been included in the projections of our operating budgets for the years 1982 to 1987. Personal service expenses in both the Water and Sewer Funds have been increased to reflect staffing levels required to meet Department goals and required for the operation of additional facilities expected to be placed in service during this period. The majority of the new facilities results from the wastewater plant upgrading program. These new facilities will result in increased power, chemical, and maintenance contract costs.

Programs to Reduce Operating Expenditures

Water Department management recognizes that personal services and power costs comprise a major portion of its operating budget. In addition, three other areas result in significant operating costs. These are the expense of sludge disposal on land, the cost associated with non-metered-water and the cost of rehabilitating an aging distribution system. With this in mind, the Department has undertaken or will shortly undertake programs to reduce these expenditures.

Savings Through Reorganization

Centralized Laboratory

During Fiscal Year 1982, the Department administratively centralized all eleven laboratories that had been administered by the various operating divisions and often provided duplicate services. Consolidation resulted in a savings of \$300,000 or 12.5% of the laboratory budget for Fiscal 1982 with no reduction in the level of services provided.

Planning and Engineering Division

Another organizational change created a Planning and Engineering Division composed of the former Engineering Division and Planning and Technical Services Division. The objectives of the change was to place in one unit, a group of functions which are closely related: long range planning, capital programming, project planning, design and construction management.

Sludge Management Unit

A Sludge Management Unit was created within the Water Pollution Control Division to be responsible for all aspects of sewage sludge processing, utilization and disposal.

Centralized Maintenance

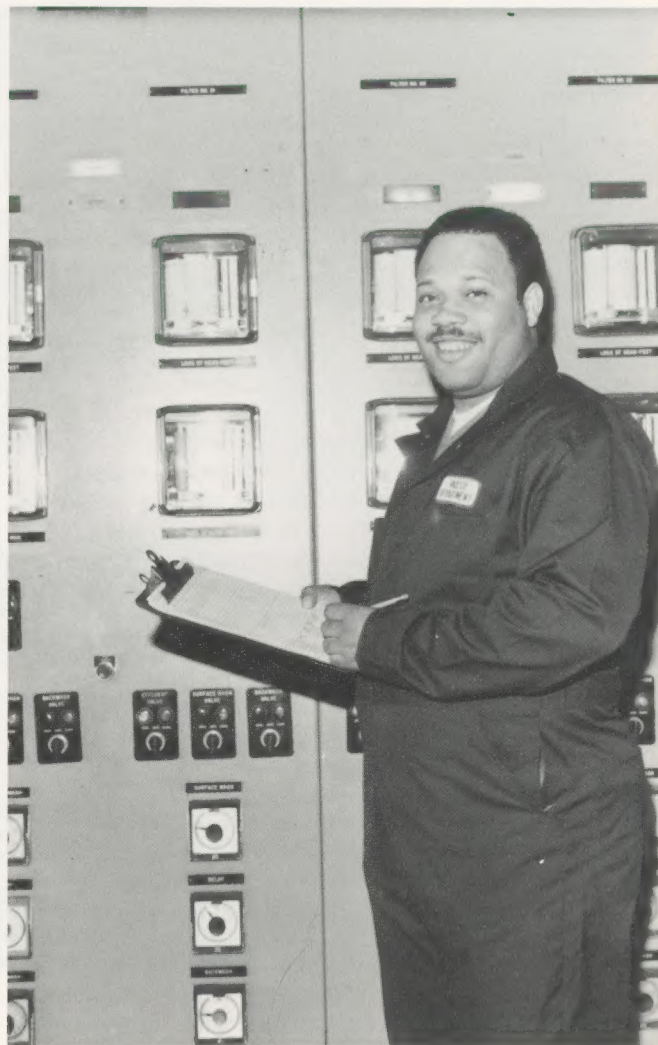
The Water Department initiated a study to evaluate the potential for a reduction in personnel services and inventory costs by centralizing the maintenance efforts currently supported independently by various operating divisions.

Energy Management

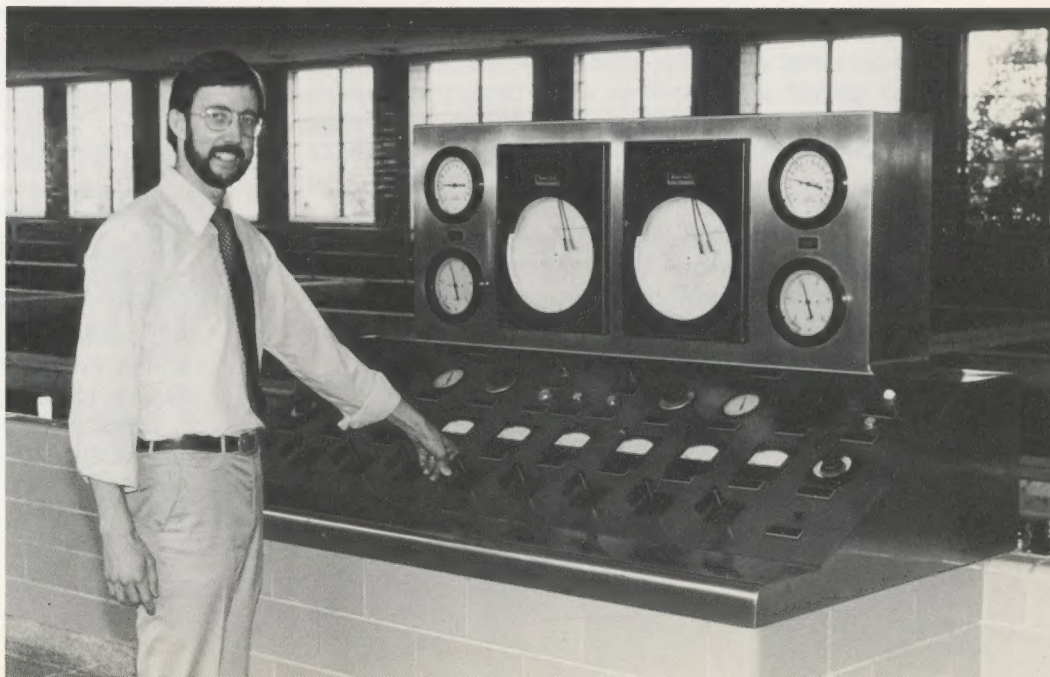
Energy costs represented 19% of all operating and maintenance expenses in Fiscal Year 1982 compared to 17% in Fiscal 1981 and, as they escalate, will become an even larger portion in the future. The Water Department has always been energy conscious, but the specter of ever increasing energy bills has forced a re-evaluation of its system and consumption patterns.

The nature of its operations, the use of mechanical equipment such as pumps, motors and compressors, make the Department a large user of energy. Charges for electricity totaled \$15,885,154 in Fiscal Year 1982, making the Philadelphia Water Department one of the largest customers of the Philadelphia Electric Company. The Department also paid \$293,765 for natural gas in that year.

The 1981 bill of \$14,688,700 for electricity represented a 30% increase over 1980, and an 81% increase over 1979 bills. However, through an Energy Conservation Program described in the following section, the Department reduced consumption of electric power at facilities so much, that costs in 1982 increased by only 4.5% over the previous fiscal year, despite an 11% rate increase.



Tomil Jones, Treatment Plant Operator (above), and William McKeon, Superintendent, Torresdale Water Treatment Plant (below), have learned to conserve energy by backwashing filters on off-peak hours.





Water System Load Control Dispatcher Alexander Karczewski keeps our energy costs down by pumping more water at night.

Energy Conservation

Against the backdrop of escalating energy costs, the Water Department initiated a Department-wide energy conservation effort in 1980. A committee was formed to oversee this effort, and a computerized energy information system was implemented. Conservation can be achieved through various routes, by improving energy efficiency, by changing operations to better utilize power rate structures, and by reducing the amounts of water and wastewater to be processed.

Pumping of water is controlled by a central load control center where decisions on staging of pumping and operations can be made. In the past, the Department has had most success with the utilization of demand control and night service for its industrial rate accounts. All of its large accounts have high tension service, which provides for the lowest unit cost available from Philadelphia Electric. Modifying operations in certain accounts, basically pumping more at night and fully utilizing reservoir storage, the Water Department reduces overall costs. Some capital improvements have helped optimize these changes—increasing reservoir storage capacity and reducing pipeline friction losses by cleaning and cement lining mains in the distribution system, for example.

At water treatment plants, operation strategies and equipment are being analyzed, and lighting and heating levels are being reduced.

On the other hand, the wastewater system will see an increase in energy consumption for the next several years, until all three new plants are in operation. Higher treatment efficiencies will be accompanied by higher electrical consumption. The new plants have been designed, however, with several components which will minimize this increase. First and foremost, the plants have been designed with energy efficient motors and other equipment, and each plant will have a computer to monitor energy usage and to assist in load control.

Energy consumption for both the water and wastewater system is very sensitive to the demand for water by customers and is subject to both seasonal and daily peaks. Of particular importance is the fact that peak demand for water occurs during Philadelphia Electric's peak demand period. This peak demand usage has a dual effect on the Department's electrical costs. It results in high costs during peak months and establishes a demand charge which must be paid at 80% of peak rate for a twelve month period.

Several programs presently being undertaken by the Water Department promise to have very beneficial effects on electrical bills through modification of water demand. A water conservation program initi-

ated in response to drought conditions in the Delaware River Basin has lowered water demand and especially has reduced illegal hydrant usage, which is the primary cause of high peak demands in the summer. This program should be continued in years to come, significantly reducing electrical bills. A successful program to reduce the level of non-metered-water will gradually reduce the amount of water required to be produced and wastewater to be treated; thereby also reducing energy consumption in both systems.

Energy Development

The second aspect of the Water Department's energy management program is the development of alternate energy sources. The Department possesses some unique resources for the development of energy. In addition to the sludge gas produced at the wastewater treatment plants, the sludge itself is a potential energy source. The Department also has a potential hydroelectric power site.

The hydropower site is the existing Fairmount Dam on the Schuylkill River. The site was once a hydropower station and pumping station. Recent federal legislation concerning power generation and marketing have made electrical generation at sites such as Fairmount economically viable. Under a preliminary permit for development granted by the Federal Energy Regulatory Commission, the Water Department is conducting a feasibility study of hydropower development at Fairmount. A preliminary study indicates a potential of 11 million kilowatt-hours per year currently valued at approximately \$750,000.

The expansion and upgrading of wastewater treatment plants means that the sludge output and, therefore, the sludge gas output will be increasing. This gas is 65% methane and will be used to fuel sludge processing equipment, plant incinerators, and space heating requirements. When sludge gas production is fully operational, however, there may still be excess gas available after these plant process uses. If projections of future sludge gas production materialize, this excess will average about one million cubic feet per day, worth \$1.2 million per year at present natural gas prices. Unfortunately, this gas cannot be sold as pipeline gas without additional expensive purification steps. Different alternatives will need to be investigated, including its use in power generation.

Sludge itself which must be disposed of at considerable cost can be used as an energy source. The energy content of the sludge can be realized through incineration. Since incineration of sludge alone will yield little net energy, coincineration with trash will be examined by the City as a disposal method and as a source of energy.

Sludge Management

Accompanying the improvement and expansion of Philadelphia wastewater service will be an increasingly more difficult sludge disposal problem. Improved treatment processes will produce large quantities of wastewater sludge. As mandated by a consent decree, the Water Department ended all ocean disposal of sludge in November, 1980. This brought to an end what had been the Department's primary and also cheapest method of sludge disposal.

Ocean dumping has not been supplanted by any single disposal method, but by a variety. Since 1975, the Department has been developing new programs. Many alternatives have been considered, but the programs offering the largest potential for disposal are strip mine reclamation, a giveaway program, a marketing program, and liquid application. Dewatering and composting have provided the best means of sludge processing in preparation for these land-based disposal methods. Actual accomplishments for Fiscal 1982 are detailed later in the Annual Report in the Water Pollution Control section.

Distribution System Rehabilitation

There are 3,240 miles of water mains in Philadelphia with an average age of 68 years.

In an effort to reduce the number of water main breaks and to improve the flow characteristics, the Department plans to initiate a capital program for main rehabilitation that will insure rapid replacement of all mains over 100 years of age.

Although financial limitations will limit the next four years to about 13 miles per year, starting in 1988, the rate will be accelerated to 29 miles per year to insure that 650 miles of main are replaced every 25 years. The total cost of the 25 year program in 1981 dollars is \$325 million.

Non-Metered Water

The Department uses two parameters to monitor the efficiency of its water distribution system. The first measures the percentage of water pumped into the distribution system which is not measured at the endpoint of the system, the customer meters. The second measures the percentage of water pumped into the distribution system for which the Department does not produce revenue. This measure is defined as the percentage of non-revenue producing consumption.

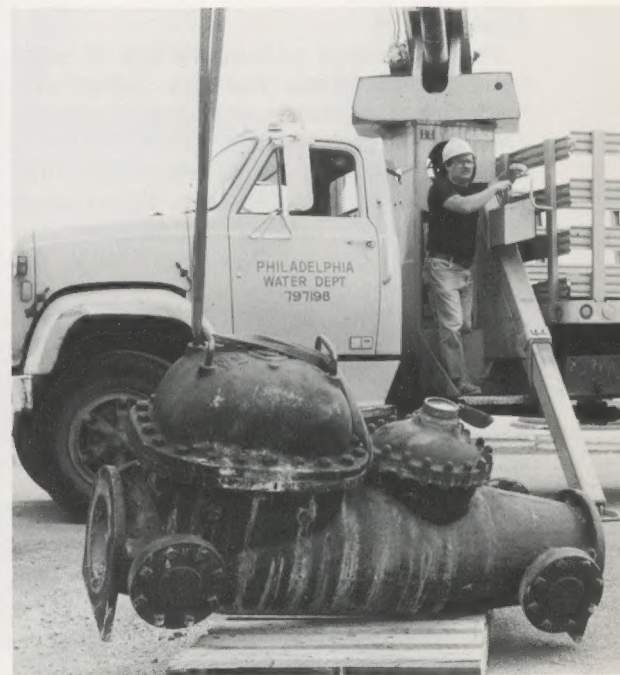
Rather than relying on the blanket replacement of all the small meters, management now feels that increased capital investment in large meters replacement would result in greater short term revenue collection for the Department and a larger reduction in non-metered water for each capital dollar spent.

The Department is expending effort to improve planning procedures for main replacement by the development of a computerized management infor-

mation system (MIS) to use in water distribution planning and rehabilitation. Information from infiltration/inflow studies, water waste surveys, water main and main break records and the abandoned service location files are to be included in the MIS to target mains for replacement based on economic, statistical and engineering criteria.

Finally, the Department plans to concentrate its efforts on three other major areas: master meter over-registration, illegal hydrant usage and abandoned ferrules. Master meters located at the three water treatment plants will receive a high calibration and maintenance priority to ensure a high degree of accuracy in the measurement of water pumped into the distribution system. The Department has instituted a firm control on illegal hydrant usage through a comprehensive hydrant lock program and the enactment of stronger enforcement procedures and penalties. Also, the Department plans to reduce the backlog in the number of abandoned services to be discontinued.

Advances in meter design have reduced the size without sacrificing accuracy. (Left to right) Samuel Oates, Nicholas Keimo and Walter Holloway lower a 210-pound, 8-inch turbine meter while (below) Michael Romeo, heavy equipment operator, lifts a 1000-pound, 8-inch compound meter.



Revenues

In order to assess the need for future rate increases and to accurately determine the impact of projected future capital and operating expenditures, the Water Department must have an estimate of expected future revenues as well as an indication of the ability of its facilities to generate these revenues. This estimate must take into account many factors, some of which, are discussed below. It should be noted that despite the need for periodic rate increases throughout its history, the Water Department has experienced a very high level of revenue collection. Over 99% of Water and Sewer Bills have been collected from active accounts.

Population Trends

Census data has shown that the population of Philadelphia has declined since 1960. The rate of decline has been increasing, resulting in a 14% reduction from 1970 levels. The 1980 census also shows that the populations of most suburban areas served by Philadelphia's water and wastewater facilities have remained nearly constant rather than incurring significant increases as had been previously projected. The exception to this is Bucks County.

Plant Capacities

The three wastewater pollution control plants were originally designed for 1990, at which time it was anticipated that their capacities would be exceeded. Based upon the projections given above, it now appears that each plant will hydraulically be capable of handling the flow and loadings through this ten year planning period and beyond. The Water Department's efforts toward infiltration/inflow control and the reduction of non-metered-water should further insure the capacity of these facilities.

The population projections have been used by the Water Department to project future potable water demand by water treatment facility. The projections reflect a 9% reduction in per capita demand for Philadelphia over this planning period as a result of expected customer conservation reflecting a resistance to increasing cost of service. For Bucks County, a rapidly increasing population is estimated to increase demand.

Comparison of water use projections with the water system capacities clearly indicates that excess system capacity exists for the water treatment facilities. Recognizing the potential of this existing capacity, a logical approach is to expand the present customer base through the sale of water to surrounding suburban communities.

Expansion of Customer Base

As pointed out previously, a solution to the population shift from the cities to the suburbs is to interconnect various utilities in a metropolitan area. This type of regional approach is used by electrical utilities. Philadelphia's wastewater system is a good example of a regionalized utility. It has served neighboring townships for a number of years and more will be incorporated as our treatment plants are expanded. In 1972 the Philadelphia Water Department also began providing water to Bucks County. Sale of water to Bucks has increased to an average of 10 MGD in 1980 and is forecasted to be 25 MGD by the year 2000.

Rates

The Water Department is empowered and required, without further authorization of City Council to fix water and sewer charges in an amount sufficient to pay all operating expenses, debt service requirements on all obligations issued for the systems, and in respect to Water and Sewer Revenue Bonds, sufficient to comply with the Rate Covenant. The most recent rate increases became effective in July 1981 and July of 1983.

The Department believes that the plan presented here will lead it toward a stable program in which rate increases can be held below the rate of inflation. The revised capital program reflects the Department's goal of cost sharing certain capital projects, such as storm flood relief, with the cities general fund, since these projects benefit the whole of the City, not just Water Department rate payers. This practice is employed by other major cities, such as Baltimore and Dallas. The Department feels that operating expenses can be reduced and will be implementing the programs presented in this plan, to accomplish this goal.

The Water System

Water Quality

Water production has progressively decreased during recent years. A concerted effort to conserve this year helped to reduce water production to 359 million gallons daily (MGD), down considerably from the high set in 1977 of 413 MGD.

Water quality not only met but exceeded the levels set forth by the state and federal regulations.

The average trihalomethane concentrations for the fiscal year of 58 parts per billion was well below the Environmental Protection Agency maximum concentration limit of 100 parts per billion.

Significant reductions in energy conservation were achieved at the water treatment plants. A major part of the energy reduction program was the washing of filters only at night. This effort made better use of less costly off peak electric rates.

Good river water quality, lowered chlorine prices and less water produced enabled each of the three plants to lower chemical treatment costs to an average of \$25.28 per million gallons compared to last year's all time high of \$27.12.

There were several industrial spills into the Delaware and Schuylkill Rivers during the year, none of which adversely affected finished water quality. Potential taste and odor problems were lessened by using additional chemicals to oxidize and neutralize the spilled material. All chemical costs associated with the spills were recovered from the businesses that caused the problems.

Water Consumption

The average daily total consumption, including the Bucks County Water and Sewer Authority for Fiscal 1982 was 329.1 million gallons, 7.5 percent less than last year. Factors causing the decline in total consumption included the occurrence of a drought emergency, conservation efforts and associated publicity, a leak detection abatement program, a decline in industrial activity, use of hydro-shield fire hydrant locks, a water rate increase, and the effects of a mild summer.

Unaccounted For Water Reduction Program

The Accelerated North Philadelphia Leak Detection Program began in November 1981 to reduce leakage in the water distribution system and yielded beneficial results. Leakage reduction by this program is expected to exceed the goal of 10 million gallons daily, set at the start of the program. It will yield savings due to reduced pumping and chemical costs and also reduce infiltration of treated water into City sewers.

Another cause of unaccounted for water is unmetered properties; 1,574 were located, metered, and billed during Fiscal 1982.



No, he is not listening to Mother Earth's heartbeat; Michael Ella, Water Distribution Supervisor, is using a geophone to detect the location of a water main leak.





The Detect-A-Leak Unit lets Milton Fletcher, Water Distribution Repairman, listen to water main valves, fire hydrants and service lines to find leak noise. Plugging the unit into the van-mounted computer allows the leak to be pinpointed with accuracy.



Water Distribution Supervisor William Cook demonstrates an electronic pipe locator used to find underground water mains and service pipes.

Corrosion Control Program

Under the Corrosion Control Program for water mains, a consulting engineering firm continued to monitor the existing corrosion control facilities, determine the need for others, and investigate the various SEPTA Power Substations—the major cause of stray electric currents which may cause corrosion of the mains. In addition, departmental employees began monthly inspections of corrosion control facilities, reducing the consultants contract cost by about \$25,000 per year.

Water System Maintenance

Distribution crews met the constant challenge of maintenance problems despite the shortage of personnel. The unit repaired 1,053 water mains during Fiscal 1982.

The distribution unit continued an on-going program of monitoring and researching the City's water mains. Samples of mains were thoroughly evaluated by the Materials Testing Laboratory to determine the metallurgic composition of the mains and also the soil's relationship to the mains. This information was used to determine when the water mains should be repaired or replaced.

To prevent unauthorized openings of fire hydrants during the summer days, distribution crews installed 2,670 locking devices.

Crews performed 526 water services shut-offs of vacant homes for the City's Clean and Seal Program.

Over 22,000 delinquent water and sewer accounts were serviced; 6,778 accounts were shut-off and \$827,818.00 was collected.

Among the jobs performed daily by the Distribution Unit were:

	FY 82	FY 81
Water Main Repairs	1053	1176
Ferrules Installed	3510	3828
Drawn or Shut Off	2931	1650
Pipeline Valves		
Inspected	4704	17349
Repaired	1583	2830
Installed	273	151
Fire Hydrants		
Inspected	23701	30024
Repaired	11231	13237
Renewed	215	177
Complaints Investigated	20822	20709
Water Services		
Shut Off for Delinquency	6778	7559
Restored	3333	5905
Excavated	3004	3890

East Park Reservoir

Work continued on modifications to the East Park Reservoirs under various contracts totaling \$10 million. The reservoir has been divided into two new basins which can be independently controlled and monitored electrically. Thousands of linear feet of embankment have been graded and reshaped. The North Basin will be lined and covered with reinforced nylon material. This floating cover will be one of the largest of its kind in the world and will protect the purity of drinking water, prevent the growth of taste and odor causing algae in the summer-time and reduce the quantity of costly chemicals needed to treat reservoir water.

Customer Service

The hurried pace was nothing new to Customer Service staff during Fiscal 1982. The telephone interviewers received 118,268 telephone calls for assistance or information pertaining to broken mains, flooded basements, opened fire hydrants, low water pressure, and clogged inlets. In response to these calls, field representatives made 11,282 inspections.

Throughout the year inspectors performed over 72,600 field inspections pertaining to billings, leaks, missing meters and permits for plumbing jobs. Violation notices were served to over 11,400 owners for repairs. In most cases, conditions were corrected and no cases were taken to court.

Under a special claims ordinance, small claims against the City for damages from broken water mains and sewers were voluntarily settled for \$53,270.

Maintenance

Meter Shop

The Meter Shop continued its ten year program to replace mechanical drive meters with magnetic meters. Meter Shop crews installed a record of 42,756 5/8" magnetic meters. The new meters register more accurately and are hermetically sealed so they do not leak from the register. They are also more readable, less costly to repair and more adaptable to remote reading.

Automotive

During the year, the automotive maintenance section performed over 22,000 operations consisting of repairs and services to vehicles, preventive maintenance, state inspections and repairs to off-the-road equipment. To combat the winter's severe temperatures, diesel fuel additives were used to ease diesel engine starting problems and saved many hours of vehicle down-time and man-hours.

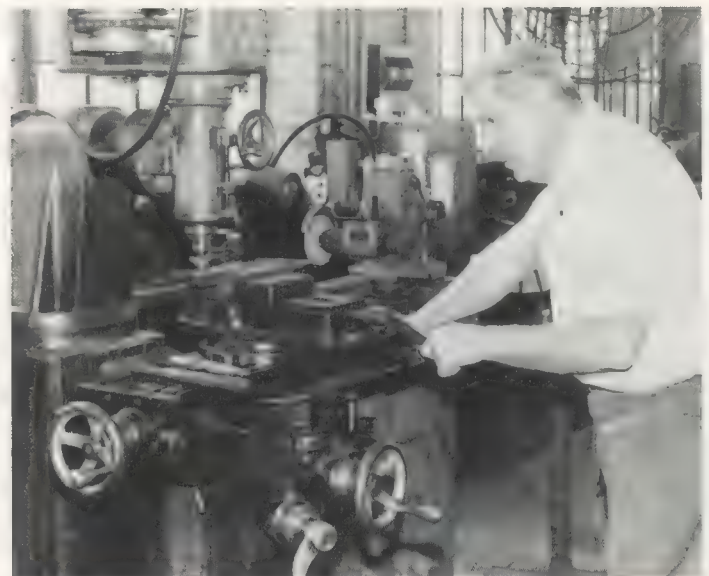
Building and Plant

Building Maintenance staff completed almost 2,000 jobs of various sizes and descriptions. Major projects included installing new boilers, building a new room to house the Security Unit and replacing the heaters at the Torredale Treatment Plant.

The Security Unit's presence at several locations was a deterrent to vandals and burglars throughout the year. Security personnel assumed responsibilities at the Northeast Water Pollution Control Plant and the Sewer Maintenance installations at 50th and Paschall Streets and 1123 Adams Avenue.

Plant Maintenance personnel performed over 1,869 jobs repairing, building and modifying equipment at all three water treatment plants. Salvaging of parts and hydrants resulted in a savings of \$86,487.65.

Skilled Machinists like Walter Eisenhower are needed to repair equipment from all three water plants.



At 5:00 A.M., We are Already Collecting Samples
Throughout the City to Ensure Your Water Quality



Top Left: Aquatic Biologist Cynthia Rettig analyzes one of the water samples taken from 74 locations in the distribution system.



Top Right: Charles Sullivan takes his morning sample as the emergency room nurse watches in the West Park Hospital.



Right: One of Holman C. Jefferson's daily stops for water samples is the Fire Station at Belmont and Viola Streets.

The Water Pollution Control System

Southeast Water Pollution Control Plant

During 1982, under the expansion program, construction was in full swing at the Southeast Water Pollution Control Plant. Each unit process was partially operative due to the piecemeal replacement of equipment. With only three of the four primary tanks operating, the plant treated 109 million gallons per day of wastewater with BOD and suspended solids removals averaging 40% and 52%, respectively, exceeding the Consent Decree requirements.

Northeast Plant

The Northeast Water Pollution Control plant has undergone another year of extensive construction activities to upgrade treatment of wastewater to 250 million gallons per day by 1990. The existing facilities treated 172 million gallons of wastewater per day, an increase of 6% over Fiscal 1981. The National Pollutant Discharge Elimination System permit regulations were met for suspended solids and Biochemical Oxygen Demand percent removal at 75% and 66%, respectively. The staff of the Northeast Water Pollution Control Plant worked closely with community groups, the Health Department, Environmental Protection Agency, and the Pennsylvania Department of Environmental Resources to resolve the complaints of odors. The Department improved unit processes and general housekeeping to abate the odors.

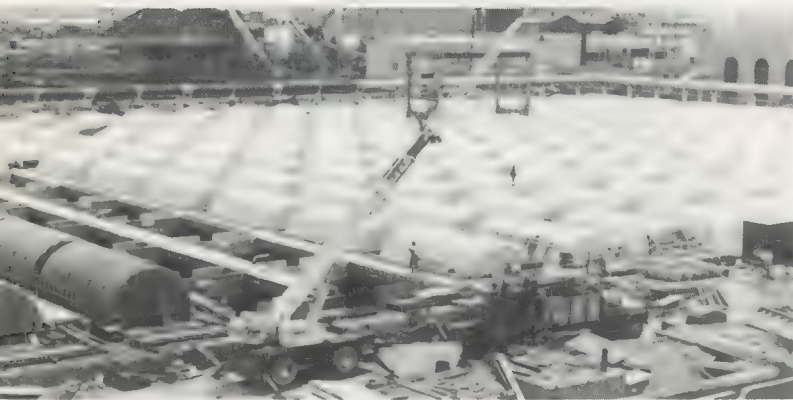
Southwest Plant

During Fiscal 1982, the plant flow increased to over 200 million gallons of wastewater processed per day for the first time.

Major construction activity was in the final stages and completion scheduled for Fiscal 1983. New equipment being operated this year included a modified primary tank, four new digesters, a new sludge conveying system, a rebuilt metering building and a roadway system. The old sludge handling building and the influent pumping station remained in service until the new facilities are completed in Fiscal 1983.

Tide Gate Study

The Southwest Infiltration/Inflow Study had originally indicated that as much as 6 million gallons of Tidal Inflow could be eliminated from the Southwest Control Plant by an in-depth study of the combined sewer regulating chamber—tide gate system. Preliminary results of this follow-up study indicate that an estimated 11.7 million gallons could be removed from the Southwest Drainage system daily. The capital cost to implement the program is an estimated \$4,626,300 and will save an estimated \$8,812,200 over the planning period.



Rows of fiberglass shells cover the 280 rotating biological contactors as they are installed (right) in the aeration tanks at the Northeast Water Pollution Control Plant.



Water Distribution System Leakage Survey

During the course of the study, over 700,000 linear feet of sewer were surveyed producing a potential of over 2 million gallons daily of Water Distribution System leakage which has physically been removed.

Detection of this type of leakage is extremely important for not only are we wasting water that has been treated for human consumption, but it is getting in the sewer system and is again being treated as wastewater.

Sludge Processing

The Sludge Processing Unit processed 35,628 dry tons of sludge, 98% of the projected goal for Fiscal 1982. At the Northeast Water Pollution Control Plant, 7,083 dry tons of sludge was dewatered and 28,545 dry tons of sludge was dewatered at the Southwest Water Pollution Control Plant, an increase of 50% over Fiscal 1981. This increase was due to operating efficiencies of the new conveying system and the belt filter presses.

Sludge Management

The Sludge Management Unit again demonstrated its dual role of developing economically and environmentally sound end uses of sludge products while still complying with federal and state regulations.

The reclamation of mined land in Western Pennsylvania again proved to be the most successful end use program in Fiscal 1982. Approximately 46,599 dry tons of sludge cake composted mixture were utilized to reclaim strip mines in Somerset, Cambria, Indiana and Clarion Counties. Continued environmental monitoring of all sites reclaimed has shown no adverse effects on water, soil or vegetation.

Delchem Services of Philadelphia began marketing and distributing screened compost material under a five year concession agreement. A total of 10,000 tons of "Gardenlife" was sold to commercial growers in Philadelphia.

Despite the introduction of the marketing program, 2,855 dry tons of compost were given away to city users during the spring of Fiscal 1982. Together with the marketing program, the Give Away Program is expected to continue as a viable cost effective means of sludge utilization.

Approximately 2,125 dry tons of liquid sludge were applied on eight sites in Philadelphia, Montgomery, Chester and Lancaster Counties.

The \$2.6 million EcoRock demonstration plant, located at the Northeast Water Pollution Control Plant, was completed in April, 1982. Environmental Protection Agency construction and innovative technology grants funded 85% of the total costs. Start-up and full operation is scheduled for Fiscal 1983.

The EcoRock process takes mixtures of dewatered sewage sludge and ground municipal incinerator residue and burns them in a rotary kiln. The hot ash droppings are then fused in a furnace at 2000°F and a hard, dense rock is formed. Bench scale studies have shown this rock to be suitable as a high quality road aggregate.

The Bulk Sludge Application Program was expanded in Fiscal 1982. A 17 acre site in Franklin D. Roosevelt Park was renovated using mine mix, a five acre demonstration site in Neshaminy State Park was reclaimed, and eight ballfields throughout the City were renovated with screened mine mix.

Sewer Construction

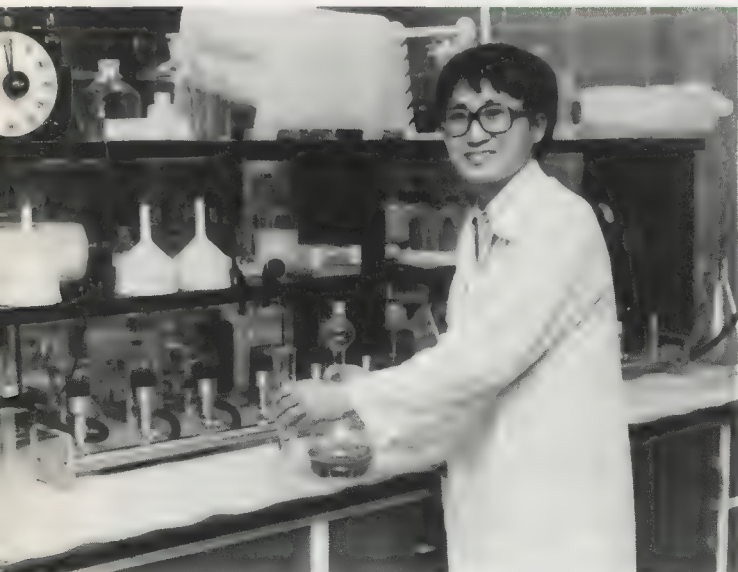
For better sewage collection, contractors built five miles of new sewer during Fiscal 1982. The new lines were intended to service new homes, eliminate unsanitary conditions, reduce storm flooding or replace old sewers in the system. Total sewage mileage at the end of Fiscal 1982 was 2,930 miles.

To reduce storm flooding due to ongoing construction of new homes and paved surfaces on open fields, the Water Department continued to replace the many old sewers that were built in the 19th century and are unable to carry today's heavier storm flows.

During Fiscal 1982, work was continued at the Mingo Creek Storm Water Pumping Station. The building enclosure for the four new pumps was completed along with the restoration of the station's existing pumps. The entire site was landscaped using philorganic as a fertilizer. The facility will be completed during Fiscal 1983, providing a pumping capability of three times that of the original station built in the 1950's.

Construction of the Belfield Avenue Relief Sewer began during Fiscal 1982 to relieve storm flooding in that area west of Broad Street. At the end of Fiscal 1982, the water main was substantially completed and approximately 300 linear feet of the twin 15' x 20' box sewer had been constructed. Upon completion of the specified stages of sewer construction, Belfield Avenue will be replaced in its entirety, including new curbs, footway and roadway paving.

Centralized Laboratory Services Coordinates Analysis of Wastewater and Hazardous Materials



Right: Technicians from the Industrial Waste Unit check explosive characteristics of an abandoned drum found in Northeast Philadelphia.

Left: Chemical Technician Jung Chol (top) and Analytical Chemist Edward Graves perform some of the 200,000 tests annually on wastewater and hazardous materials.

Wastewater Pumping

The Ford Road Pumping Station was completed and accepted during Fiscal 1982. The most notable improvements have been the simplified control scheme, the replacement of the motor operated valves and two-phase power with three-phase power.

The rehabilitation of the Neill Drive Pumping Station was completed during Fiscal 1982. The work included the replacement of the sewage pumps and motors, comminutor, and the installation of a wet well ventilating system for increased safe operations.

Restoration work at the Central Schuylkill Pumping Station included the installation of new outdoor lighting, battery chargers, receptacles and two field application units. Testing of the switchgear and cables resulted in the replacement of the 2400 volt feeders along with the 208 volt feeders.

Sewer Maintenance

To keep sewers operating efficiently, maintenance crews performed 18,837 jobs. They examined 98 miles of sewers and checked another 6.2 miles with television monitors. Crews cleaned 50.5 miles of sewers by the high pressure flusher and the mechanical bucket. They rodded .65 miles of choked sewers and inlets, and cleaned 96 acres of ground and streams.

Daily maintenance performed by the crews including inspections, repairs, cleanings or reconstructions were:

Sewers	11,213
Inlets	6,983
Manholes	348
Laterals	36
Drainage Right-of-Ways	257

Interceptor Services

There are 14 major collector systems and 174 regulator units in the Philadelphia sewer system. The Interceptor Services Unit performed 6,385 inspections during Fiscal 1982, a 28% increase over the projected goal.

Industrial Waste Control

The Industrial Waste Unit began monitoring programs and negotiating with individual firms as the first stage in enforcement of the Wastewater Control Regulations passed in January 1977. These regulations impose strict limits on the discharge of heavy metals, oil, greases, and other substances by industries to help the City meet federal standards for wastewater plant effluents, improve sludge quality for land disposal, and protect the Department's plants from treatment upsets.

In Fiscal 1982, 1196 industrial wastes surcharge samples were collected, 38 sewer rental factors were reviewed or calculated, 39 special quarterly surcharge bills were prepared, 1620 special wastewater samples were collected, and hundreds of field investigations of chemical spills and other complaints were conducted.

Inlet Cleaning

The Inlet Cleaning Section is responsible for the inspection and cleaning of 75,000 sewer inlets to insure that rainwater may run smoothly into stormwater and combined sewers.

During Fiscal 1982, crews cleaned 62,286 inlets, removing 1.5 million cubic feet of debris and replaced 6,542 inlet covers. Missing or stolen inlet covers are a problem to the Department causing hazardous conditions which become expensive law claims. The installation of round concrete inlet covers as replacements for missing metal covers has proven successful.

Engineering Services

Design

Design engineers and technicians prepared plans, specifications and estimates for 134 projects totaling 26 million dollars. The projects included automation of filter and chemical systems at two water treatment plants, new facilities for Automobile and Sewer Maintenance, Water Pollution Control Plant expansions and many miles of distribution mains and sewers.

Design staff also assisted the State Highway Department, the Streets Department and Transit Authorities with the expansion of highways, bridges and street improvements.

Construction

In Fiscal 1982, Construction Branch engineers supervised 222 contracts with a combined value of \$116.5 million. Of these, 103 projects were completed totalling \$29 million and 119 projects totalling \$87.5 million were active. Expansion of the three Water Pollution Control Plants as required by the Federal Water Pollution Control Act of 1972 was ongoing with 29 contracts completed at a cost of \$5.5 million.



Planning and Technical Services

The Planning and Research Section is responsible for providing technical services in the areas of applied research, planning, management support and laboratory services for the Water Department.

During Fiscal 1982, Planning and Research investigated several Water Department activities which showed considerable potential for controlling the department's capital and operating expenses. Included in these activities were the energy conservation program, the control of unaccounted-for-water and the development of a financial planning model which allows the Department to assess the impact of its capital program and operational budget upon the need for additional revenue requirement.

Materials Testing Laboratory

The Materials Testing Laboratory continued in Fiscal 1982 to provide professional testing and consulting services to various units within the Water Department and to other City departments. The laboratory performed 180,536 tests on 12,080 samples of material used in construction projects and in the maintenance of City facilities as well as general City supplies. The testing, a 13% increase over Fiscal 1981, was to insure that the City of Philadelphia received safe and quality products.

A major development of the year was the testing of fibers and coatings in bullet-proof vests used by the Police Department. The laboratory's new techniques aided the Procurement Department in writing the specification of this important item.

Surveyor Francis Bevenour (right) checks the work of Engineering Aides Shiela Utley and William Trainor on one of the 222 contracts during Fiscal 1982.

Management and Fiscal

Personnel Developments

The Personnel Office continued to offer various training programs to the Department's employees throughout Fiscal 1982. The Department paid part of or all of the tuition for forty-two post-high school courses attended by thirty-three employees.

Many employees attended specialized or technical courses offered by industries or special schools. The Department's most obvious achievement was the Mechanical Trades Training Program designed to upgrade employees to skilled trades positions.

This year's college recruitment program was successful in obtaining twenty-two new graduate engineers, including five females and the first black engineer recruited from a college in the nineteen years the program has been in existence.

Sick leave usage was reduced to 11.29 days per year per employee, 12.4% lower than the previous year's rate.

Safety

The Safety Office initiated a Confined Space Entry Program, designed to train Sewer Maintenance, Inlet Cleaning, Interceptor Services and Water Pollution Control Plant employees in safe procedures for entering confined spaces.

Safety committees were established at various units and were able to correct over fifty safety problems. Training sessions in fire prevention, solvent handling, and eye protection were attended by three hundred employees.

The number of disabling injuries per million man hours worked was reduced to 35.27. Actual work days lost because of injury, however, increased from 547 in Fiscal 1981 to 2,661. The increase was due to the service connected death of George Roy of the Sewer Maintenance Section.

The motor vehicle accident frequency rate decreased to 53.63 in Fiscal 1982. The Motor Vehicle Accident Review Board heard twenty-four appeals of determination of accident preventability and ruled that 15 were, in fact, preventable.

Even Aquatic Biologists like Gary Burlingame have to learn how to put out laboratory fires under the department's safety program.

Fiscal Unit

The Fiscal Unit of the Administrative Division is responsible for budget preparation and control, cost accounting, plant investment records, and water and wastewater rate development. In May of 1982, this unit was removed from Administration and placed under a new Water Department Deputy Commissioner in charge of Finance.

Financial Highlights

To support the massive upgrading of the three water pollution control plants, \$125 million of Water and Sewer Revenue Bonds, Seventh Series, were sold in October of 1981.

Renegotiation of water and sewer agreements with suburban townships produced more than \$1 million in additional revenue over Fiscal 1981. The new agreements allowed for recovery of full cost of service to wholesale customers.

Through negotiation with the Commonwealth of Pennsylvania Act 339, operating subsidies for the three wastewater plants were increased \$500,000.00 per year.

Because of limited space, the complete 27 page financial report cannot be reproduced here. However, on the next two pages, we are presenting three schedules which present the reader with an understanding of the magnitude of the Fiscal operation.



**City of Philadelphia Water Department—
Administering The Water and Sewer Funds**

**CONSOLIDATED SUPPLEMENTAL SCHEDULE OF RATE COVENANT COMPLIANCE FOR
THE FISCAL YEAR ENDED JUNE 30, 1982 AND 1981 (Amounts in Thousands of Dollars)
(Legally Enacted Basis)**

LINE NO.		1982	1981
	PROJECT REVENUES:		
1.	Water	\$ 67,897	\$ 55,540
2.	Wastewater	98,770	77,507
3.	Total	<u>166,667</u>	<u>133,047</u>
	OPERATING EXPENSES:		
4.	Water	47,233	44,453
5.	Wastewater	53,304	49,919
6.	Total Operation and Maintenance Expenses	100,537	94,372
7.	Less—interdepartmental charges	(8,622)	(7,456)
8.	Net operating expenses	<u>91,915</u>	<u>86,916</u>
9.	Net earned project revenues	74,752	46,131
10.	Unencumbered funds available for appropriation at beginning of fiscal year	216	15,121
11.	Adjusted net project revenues	<u>\$ 74,968</u>	<u>\$ 61,252</u>
	DEBT SERVICE:		
	Revenue bonds debt service:		
12.	Principal	\$ 6,695	\$ 5,130
13.	interest	47,520	26,529
14.	Less—Interest capitalized	(21,569)	(3,905)
15.	Total revenue bonds debt service	<u>32,646</u>	<u>27,754</u>
	General obligation bonds debt service:		
16.	Principal	14,658	14,628
17.	Interest	6,635	7,198
18.	Total general obligation bonds debt service	<u>21,293</u>	<u>21,826</u>
19.	Total debt service	<u>\$ 53,939</u>	<u>\$ 49,580</u>
	OTHER CHARGES:		
20.	Interdepartmental charges	<u>\$ 8,622</u>	<u>\$ 7,456</u>
21.	Total revenues and beginning unencumbered balance (Line 3 + 10)	<u>\$166,883</u>	<u>\$148,168</u>
22.	Total operating expenses, debt service and other charges (Line 8 + 19 + 20)	<u>154,476</u>	<u>143,952</u>
23.	Net unapplied project revenues	12,407	4,216
24.	Funds transferred to General Fund	4,994	4,000
25.	Unencumbered funds available for appropriation at end of fiscal year	<u>\$ 7,413</u>	<u>\$ 216</u>

BACK COVER: Sewer Inspector Ezzard Phillips holds a TV camera which will be pulled through the sewer to determine its condition.



**City of Philadelphia Water Department—
Administering the Water and Sewer Funds**

**CONSOLIDATED SUPPLEMENTAL SCHEDULE OF RATE COVENANT COMPLIANCE FOR THE FISCAL
YEAR ENDED JUNE 30, 1982 and 1981 (Amounts in Thousands of Dollars) (Legally Enacted Basis)**

Pursuant to Section 4.03 (b) of the General Water and Sewer Revenue Bond Ordinance of 1974 (Bill No. 1263), the City is required to impose, charge and collect in each Fiscal Year rates and charges at least sufficient, together with that portion of the unencumbered amount of the operating funds balances available and reserved for appropriation of the payment of Operating Expenses at the commencement of such Fiscal Year, which together with all other project revenues to be received in such Fiscal Year, shall equal not less than the greater of:

A. The sum of:

- (i) All Net Operating Expenses payable during such Fiscal Year;
- (ii) 150% of the amount required to pay the principal of and interest on all Bonds issued and outstanding hereunder which will become due and payable during such Fiscal Year; and
- (iii) the amount, if any, required to be paid into the Sinking Fund Reserve during such Fiscal Year; or

B. The sum of:

- (i) all Operating Expenses payable during such Fiscal Year; and
- (ii) all Sinking Fund deposits required during such Fiscal Year in respect of all outstanding Bonds and in respect of all outstanding general obligation bonds issued for improvements to the water or sewer systems and all amounts, if any, required during such Fiscal Year to be paid into the Sinking Fund Reserve.

Coverage is computed as follows:

Coverage A	1982	1981
Line 3	\$166,667	\$133,047
– Line 8	(91,915)	(86,916)
+ Line 10	216	15,121
	<u>74,968</u>	<u>61,252</u>
+ Line 15	32,646	27,754
= Coverage	2.29x	2.21x
Coverage B		
Line 3	166,667	\$133,047
– Line 6	(100,539)	(94,372)
+ Line 10	216	15,121
	<u>66,346</u>	<u>53,796</u>
+ Line 19	53,939	49,580
= Coverage	1.23x	1.09x

**WATER AND SEWER FUNDS
ASSETS**

FISCAL YEARS ENDED JUNE 30, 1982 AND 1981

	(In Thousands)	
	1982	1981
Current Assets	97,362	59,665
Restricted Assets	176,004	151,426
Property, Plant and Equipment	<u>1,012,792</u>	<u>863,572</u>
	1,286,163	1,074,663

**WATER AND SEWER FUNDS
LIABILITIES AND FUND EQUITY**

FISCAL YEARS ENDED JUNE 30, 1982 AND 1981

	(In Thousands)	
	1982	1981
Current Liabilities	89,024	85,312
Long-Term Liabilities	730,147	627,148
Fund Equity	<u>466,992</u>	<u>362,203</u>
	1,286,163	1,074,663

